Confirmation No. 9481

N THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	KLOOTWIJK	Examiner:	Nadav, O.
Serial No.:	10/544,216	Group Art Unit:	2811
Filed:	August 1, 2005	Docket No.:	NL030089 US
Title:	TRENCH ISOLATION STRUCTURE, SEMICONDUCTOR ASSEMBLY COMPRISING SUCH A TRENCH ISOLATION, AND METHOD FOR FORMING SUCH A TRENCH ISOLATION		

AMENDED APPEAL BRIEF

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Dear Sir:

This Amended Appeal Brief is submitted pursuant to 37 C.F.R. §41.37, in response to the Notification of Non-Compliant Appeal Brief dated December 4, 2008.

Appellant assumes that the Notification of Non-Compliant Appeal Brief is based on a misapplication of 37 CFR 41.37(c)(1)(v), which only requires that dependent claims that are argued separately and that contain means/step plus function limitations be listed in the summary of claimed subject matter section with reference by page and line number. In an effort to expedite this Appeal, however, Appellant has listed dependent claims 2-4 in Section V of this Brief with reference by page and line number as requested by the Examiner, even though no assertion with regard to claims 2-4 containing means/step plus function limitations is being made by Appellant. Appellant has also amended Section V to add additional reference characters in relation to independent claim 5. This amended Section V is to be used in place of the Section V in Appellant's Appeal Brief filed on September 8, 2008. As can be best understood, Appellant submits that this Amended Brief overcomes all the reasons for non-compliance stated in the notification. Should there be any other issue(s), Appellant would request clarification and an opportunity to respond.

If necessary, authority is given to charge/credit Deposit Account 50-0996 (NXPS.234PA) additional fees/overages in support of this filing.

I. Real Party In Interest

The real party in interest is NXP Semiconductors. The application is presently assigned of record, at reel/frame nos. 017540/0783 to NXP, B.V., headquartered in Eindhoven, the Netherlands.

II. Related Appeals and Interferences

While Appellant is aware of other pending applications owned by the above-identified Assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

III. Status of Claims

Claims 1-5 stand rejected and are presented for appeal. Claims 6-10 have been withdrawn and claim 11 has been cancelled, and therefore claims 6-11 do not form part of this appeal. A complete listing of the claims under appeal is provided in an Appendix to this Brief.

IV. Status of Amendments

The Amendment dated June 3, 2008, and which was presented after the Final Office Action, was not entered. As such, the claims appearing in the Appendix to the Brief reflect the claims as presented on January 25, 2008.

V. Summary of Claimed Subject Matter

Appellant's invention is related to trench isolation structures and to semiconductor devices that include trench isolation structures.

Commensurate with independent claim 1, an example embodiment of the present invention is directed to a trench isolation structure (*see, e.g.*, Figs. 1, 2 and 6, along with page 3:30 through page 4:19 and page 7:32 through page 9:15), which includes a slab of semiconducting material (*see, e.g.*, semiconductor slab 1 shown in Figs. 1, 2 and 6, along with page 7:32-33 and page 8:16-18) having a surface (*see, e.g.*, the surface on which epitaxial layer 3 is formed, as shown in Figs. 1, 2 and 6, along with page 7:32-33) and a buried layer which extends parallel to the surface (*see, e.g.*, buried layer 2 shown in Figs. 1, 2 and 6, along with page 7:32-33), the buried layer having an upper surface and a lower surface (*see, e.g.*, upper surface 2a and lower surface 2b as shown in Figs. 1, 2 and 6, along with page 7:32-33); a trench groove extending at least from the surface through the buried layer down to a part of the slab below the buried layer (*see, e.g.*, trench groove 4 shown in Figs. 1, 2 and 6, along with page 8:1-3 and page 8:20-28), the trench groove including a liner of a first insulating material on a wall of the trench groove (*see, e.g.*, first insulating material 5 shown in Figs. 1, 2 and 6, along with page 8:33 through page 9:10), wherein a remaining part of the trench groove is at least partially filled with a first filler material (*see, e.g.*, first filler material 6 shown in Figs. 1, 2 and 6, along with page 9:11-15), and wherein the liner in at least a first part of the trench groove that is substantially in line with the upper and lower surfaces of the buried layer has a thickness that is larger than a thickness of the liner in a second part of the trench groove, the second part of the trench groove located below the first part (*see, e.g.*, first part A of liner 5 of trench groove 4 as shown in Fig. 6, along with page 13:1-3).

Commensurate with dependent claim 2, an example embodiment of the present invention is directed to a trench isolation structure according to claim 1 (*see* the above discussion of claim 1), characterized in that the thickness of the liner in the first part of the trench groove (*see, e.g.*, first part A of liner 5 of trench groove 4 as shown in Fig. 6, along

with page 13:1-3) is larger than a thickness of the liner in a third part of the trench groove (*see, e.g.*, the part of liner 5 of trench groove 4 above the first part A as shown in Fig. 6, along with page 13:1-3), the third part of the trench groove located above the first part of the trench groove.

Commensurate with dependent claim 3, an example embodiment of the present invention is directed to a trench isolation structure according to claim 1 (*see* the above discussion of claim 1), characterized in that the first part of the trench groove is completely filled with the first insulating material (*see, e.g.*, the part of trench groove 4 in line with buried layer 2 that is filled with insulating material 7 and liner 5 as shown in Fig. 1, along with page 9:16-26).

Commensurate with dependent claim 4, an example embodiment of the present invention is directed to a trench isolation structure according to claim 3 (*see* the above discussion of claim 3), characterized in that the first part of the trench groove extends substantially in line with the buried layer (*see, e.g.*, the part of trench groove 4 in line with buried layer 2 that is filled with insulating material 7 and liner 5 as shown in Fig. 1, along with page 9:16-26).

Commensurate with independent claim 5, an example embodiment of the present invention is directed to a semiconductor assembly that includes a trench isolation structure in accordance with claim 1 (*see* the above discussion of claim 1), and at least one semiconductor device present on the surface of the slab of semiconducting material (*see, e.g.*, the semiconductor device schematically indicated by emitter 11, base 12 and collector 13 shown in Fig. 5 on the surface on semiconductor slab 1, along with page 11:28 through page 12:5), wherein the semiconductor device is insulated by means of the trench isolation structure (*see, e.g.*, page 5:3-6 and page 11:28 through page 12:5).

As required by 37 C.F.R. § 41.37(c)(1)(v), a concise explanation of the subject matter defined in the independent claims involved in the appeal is provided herein. Appellant notes that representative subject matter is identified for these claims; however, the abundance of supporting subject matter in the application prohibits identifying all textual and diagrammatic references to each claimed recitation. Appellant thus submits that other application subject matter, which supports the claims but is not specifically identified above, may be found

elsewhere in the application. Appellant further notes that this summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to the appended claims and their legal equivalents for a complete statement of the invention.

VI. Grounds of Rejection to be Reviewed Upon Appeal

The grounds of rejection remaining to be reviewed on appeal are as follows:

A. Claims 3 and 4 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

B. Claim 5 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

C. Claims 1-5 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,150,686 (Sugiura).

VII. Argument

Appellant requests that the Board reverse the rejections of all pending claims 1-5 for the reasons discussed below. In particular, Appellant submits that the Examiner has failed to present a valid reason for the proposed modification of the Sugiura reference, particularly because the Examiner's proposed modification would render the Sugiura reference unsatisfactory for its intended purpose, and that the Examiner has not demonstrated correspondence between the Sugiura reference and all the features recited in the claimed invention. Moreover, the § 112 rejections are baseless and unsupported by any proper reasoning.

A. Claims 3 and 4 are fully supported, and the § 112(1) rejection should be reversed as improper.

1. The § 112(1) rejection is based on the Examiner's erroneous interpretation that claim 1 is somehow limited to Figure 6, and that Figure 6 precludes the features of claims 3 and 4.

The § 112(1) rejection of claims 3 and 4 cannot be maintained because the subject matter of these claims is fully supported by Appellant's specification, and because the Examiner

has failed to establish that Appellant's disclosure does not comply with the written description requirement. Briefly, the Examiner argues that Appellant's Specification provides no support for the features of claim 1 co-existing with the features of claims 3 or 4. The Examiner comes to this conclusion by observing that claim 1 reads on Figure 6, and that Figure 6 does not specifically show the features recited in claims 3 and 4. Appellant disagrees with the Examiner's assessment that the subject matter recited in claim 1 is somehow confined to Figure 6, and submits that nothing in Figure 6 or Appellant's Specification excludes the claim 3 and 4 features from co-existing with the claim 1 features.

In order to satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. *See, e.g.,* M.P.E.P. § 2163. Appellant is in full compliance.

Claims 3 and 4 recite features directed to a first part of a trench groove being completely filled with a first insulating material, and the first part of the trench groove extending in line with a buried layer. Appellant submits that support for such features can be found, for example, in Paragraph 0016 of Appellant's specification. More specifically, Paragraph 0016 states that the first part of the trench groove can be completely filled with the first insulating material, meaning that the first insulating material is present in a cross-section taken through the first part of the trench groove in a plane parallel with the plane of the buried layer. Appellant notes that Paragraph 0016 is not written to exclude the features disclosed in the preceding and subsequent paragraphs. Moreover, Appellant submits that one of skill in the art would understand Appellant's description as teaching that the features recited in claims 3 and 4 are fully compatible with the features recited in claim 1.

For at least these reasons, Appellant submits that claims 3 and 4 are fully supported. As such, the § 112(1) rejection of claims 3 and 4 is improper, and Appellant requests that it be reversed.

2. The Examiner has failed to meet the initial burden of providing sufficient evidence to support the lack of written description rejection, and therefore the presumption of adequate description should govern.

Appellant further submits that the Examiner has failed to provide sufficient evidence to support the § 112(1) rejection. As is clear from the preceding discussions, whether or not any features from claims 3 and 4 are specifically illustrated in a drawing such as Figure 6 which exemplifies certain embodiments provides insufficient basis for a lack of written description rejection. In accordance with M.P.E.P. § 2163, a description as filed is presumed to be adequate, unless or until sufficient evidence or reasoning to the contrary has been presented by the examiner to rebut the presumption. The Examiner has the initial burden of presenting by a preponderance of evidence why a person skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. In this instance, the Examiner has not presented any evidence that the skilled artisan would fail to recognize in Appellant's disclosure a description of the invention defined by claims 3 and 4. In fact the Examiner specifically identifies support for aspects of claims 1, 3 and 4 in various ones of Appellant's Figures. In addition, Appellant has specifically pointed the Examiner to portions of Appellant's disclosure that provided support for claims 3 and 4. Accordingly, the Examiner has failed to establish that Appellant's disclosure does not comply with the written description requirement.

In view of the above, the § 112(1) rejection of claims 3 and 4 is improper and Appellant requests that it be reversed.

B. Claim 5 constitutes an acceptable independent claim structure, and therefore the rejection of claim 5 under U.S.C. § 112(2) is improper and should be reversed.

The § 112(2) rejection of claim 5 cannot stand because the Examiner has failed to present any support for the assertion that claim 5 is indefinite. The Examiner merely asserts without further explanation that claim 5 fails to provide further limitation to claim 1, and therefore is indefinite. Moreover, the Examiner has not provided any support from the M.P.E.P. or any relevant statute, rule, or court holding that would support an assertion that a claim which

adds elements to those recited in a previous claim is indefinite by failing to further limit the previously recited features.

Claim 5 is constructed as an independent claim reciting a semiconductor assembly that includes a trench isolation structure of claim 1. In relevant part, M.P.E.P. § 2173.05(f) states that, "[a] claim which makes reference to a preceding claim to define a limitation is an acceptable claim construction which should not necessarily be rejected as improper or confusing under 35 U.S.C. 112, second paragraph." The Examiner has provided no reason why this general rule should not be followed in this case. Accordingly, the § 112(2) rejection of claim 5 is improper and Appellant requests that it be reversed.

C. The rejection of claims 1-5 under U.S.C. § 103(a) over Sugiura is improper and should be reversed.

1. There is no valid reason for the Examiner's proposed modification of the Sugiura reference because it would change Sugiura's principle of operation.

Appellant submits that the modification of the Sugiura reference proposed by the Examiner would alter Sugiura in a manner that changes the principle of operation, and that would render Sugiura's disclosed device unsatisfactory for its intended purpose. According to M.P.E.P. § 2143.01(VI), "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." Moreover, M.P.E.P. § 2143.01 states that when a proposed modification would render the prior art reference unsatisfactory for its intended purpose, then there can be no suggestion or motivation to make the proposed modification. *See, In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984).

The Examiner has asserted that it would have been obvious to the skilled artisan to use Sugiura's trench structure as a trench isolation structure, as claimed by Appellant. However, the Sugiura reference is directed to a dynamic semiconductor memory device that uses a trench capacitor as a capacitor element constitution in a memory cell. *See, e.g.*, Figure 1, Col. 1:7-10, Col. 3:20-35, and Col. 5:32-36. In particular, Sugiura teaches that the electrode 15 formed in the trench 12 is capacitively coupled to the lower region 11B of the semiconductor

substrate 11and that insulator 13 is the capacitor insulating film. *See* Figure 1 and Col. 3:28-35. The Examiner proposes to modify Sugiura such that the disclosed trench capacitor memory cell (*i.e.*, an active element) becomes a trench isolation structure (*i.e.*, a passive element), thereby altering Sugiura's principle of operation and rendering it unsatisfactory for its intended purpose. As such, Appellant submits that there is no valid reason for the skilled artisan to make such a modification while still retaining the functional operability of Sugiura's trench capacitor memory cell.

Accordingly, the § 103(a) rejection of claims 1-5 is improper and Appellant requests that it be reversed.

2. The Examiner has improperly interpreted the claims, and has failed to establish correspondence with various features recited in the claims.

Appellant submits that the § 103(a) rejection is improper for failure to establish correspondence between the Sugiura reference and all the elements recited in Appellant's claims. In attempting to assert correspondence, the Examiner has improperly interpreted numerous aspects of Appellant's claims. According to M.P.E.P. § 2111, the USPTO determines the scope of claims in patent applications not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction in light of Appellant's specification as it would be interpreted by one of ordinary skill in the art. In this instance, Appellant submits that the Examiner has interpreted Appellant's claims in a manner that is broader than the broadest reasonable construction by the skilled artisan in light of Appellant's specification. The following discussion particularly addresses these issues with reference to specific claim limitations.

As a first example, regarding claim 2, the cited portions of the Sugiura reference do not correspond to aspects of the claimed invention directed to the thickness of the first insulating material in the first part of the trench groove being larger than the thickness of the first insulating material in the third part of the trench groove, which is above the first part. Claim 2 recites that a first insulating material in the third part of the trench groove, which would be readily apparent to the skilled artisan. Irrespective of the Examiner's continued assertion that zero corresponds to a thickness, the cited portions of Sugiura do not teach a

liner/layer of insulating material on the portion of the wall of trench 12 that is above oxide film 14, as claimed. The Examiner asserts that the thickness of the liner/layer of insulating material on the walls of trench 12 above oxide film 14 has "zero thickness." There is no dispute that the Sugiura reference fails to teach any insulator above the silicon oxide film 14. As such, the Examiner has failed to demonstrate correspondence between the claim limitations directed to first insulating material in the third part of the trench groove, which is above the first part.

As a second example, regarding claim 3, the cited portions of the Sugiura reference do not correspond to aspects of the claimed invention directed to the first part of the trench groove being completely filled with the first insulating material. The Examiner improperly bases the rejection on the assertion that the thick part of oxide film 14 is completely filled with the first insulating material. However, claim 3 recites that the first insulating material completely fills the first part of the trench groove (*i.e.*, the part of trench 12 that is substantially in line with the upper and lower surfaces of n-buried layer 18). Figure 1 of Sugiura clearly shows that this part of trench 12 is filled with an electrode 15. More specifically, there is no portion of trench 12 that is completely filled with the first insulating material (asserted to be oxide layer 14). *See, e.g.*, Figures 1 and 2.

For at least these additional reasons, exemplified with reference to features recited in claims 2 and 3, Appellant submits that the § 103(a) rejection of claims 1-5 is improper, and requests that it be reversed.

VIII. Conclusion

In view of the above, Appellant submits that the rejections of claims 1-5 are improper and therefore requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the undersigned's deposit account was provided on the first page of this brief.

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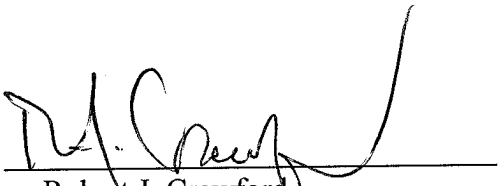
By: 
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APPENDIX OF CLAIMS INVOLVED IN THE APPEAL
(S/N 10/544,216)

1. Trench isolation structure, comprising:

a slab of semiconducting material having a surface and a buried layer which extends parallel to the surface, the buried layer having an upper surface and a lower surface; and

a trench groove extending at least from the surface through the buried layer down to a part of the slab below the buried layer and

the trench groove including a liner of a first insulating material on a wall of the trench groove, and

wherein a remaining part of the trench groove is at least partially filled with a first filler material, and wherein the liner, in at least a first part of the trench groove that is substantially in line with the upper and lower surfaces of the buried layer, has a thickness that is larger than a thickness of the liner in a second part of the trench groove, the second part of the trench groove located below the first part.

2. Trench isolation structure according to claim 1, characterized in that the thickness of the liner in the first part of the trench groove is larger than a thickness of the liner in a third part of the trench groove, the third part of the trench groove located above the first part of the trench groove.

3. Trench isolation structure according to claim 1, characterized in that the first part of the trench groove is completely filled with the first insulating material.

4. Trench isolation structure according to claim 3, characterized in that the first part of the trench groove extends substantially in line with the buried layer.

5. Semiconductor assembly, comprising a trench isolation structure according to claim 1, and at least one semiconductor device present on the surface of the slab of semiconducting material, wherein the semiconductor device is insulated by means of the trench isolation structure.

APPENDIX OF EVIDENCE

Appellant is unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS

As stated in Section II above, Appellant is unaware of any related appeals, interferences or judicial proceedings.